

Please type a plus sign (+) inside this box →



PTO/SB/05 (12/97)
Approved for use through 09/30/00. OMB 0651-0032

Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.

F0422SN-US

Total Pages

55

First Named Inventor or Application Identifier

Tsutomu Muraoka

Express Mail Label No.

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO:

Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. ☒ Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)

2. ☒ Specification [Total Pages **38**]

- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

3. ☒ Drawing(s) (35 USC 113) [Total Sheets **15**]

4. Oath or Declaration [Total Pages]

- a. ☐ Newly executed (original or copy)
- b. ☐ Copy from a prior application (37 CFR 1.63(d))
(for continuation/divisional with Box 17 completed)
[Note Box 5 below]

☐ DELETION OF INVENTOR(S)

Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).

5. ☐ Incorporation By Reference (useable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. ☐ Microfiche Computer Program (Appendix)

7. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)

- a. ☐ Computer Readable Copy
- b. ☐ Paper Copy (identical to computer copy)
- c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. ☐ Assignment Papers (cover sheet & document(s))

9. ☐ 37 CFR 3.73(b) Statement (when there is an assignee) ☐ Power of Attorney

10. ☐ English Translation Document (if applicable)

11. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations

12. ☐ Preliminary Amendment

13. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)

14. ☐ Small Entity Statement filed in prior application, Status still proper and desired

15. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)

16. ☐ Other:

17. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP)

of prior application No: _____

18. CORRESPONDENCE ADDRESS

☐ Customer Number or Bar Code Label

(Insert Customer No. or Attach bar code label here)

or ☒ Correspondence address below

NAME

David L. Tarnoff
Shinju Global IP Counselors, LLP

ADDRESS

1233 Twentieth Street, NW
Suite 700

CITY

Washington

STATE

D.C.

ZIP
CODE

20036-2680

COUNTRY

United States

TELEPHONE

(202) 293-0444

FAX

(202) 293-0445

[Page 1 of 2]

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

F0422SN-US

PATENT APPLICATION

for

MAGNET HOLDER FOR A SPOKE

Inventor:

Tsutomu Muraoka

Kazuo Wada

Kozo Kitagawa

Assignee:

SHIMANO INC.

MAGNET HOLDER FOR A SPOKE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to a magnetic device for a bicycle monitoring device. More specifically, the present invention relates to a magnet holder of the monitoring device that can be easily installed on a spoke.

2. Background Information

It is an advantage for modern cyclists to know how fast they are going. This is true in both non-competitive and competitive cycling. To that end, speedometer devices for bicycles have become commercially popular. Early forms of these devices had various mechanical disadvantages. One source of difficulty was the means by which the speedometer device sensed that the wheel had rotated. Many speedometers attached a counting device that protruded from the spoke, and would advance a gear or a counter every time the wheel rotated. But these devices were not reliable and subject to breakdown, bending, stiffening, and shifting loose from the appropriate position. This led to inductive-type sensors, which did away with the requirement of actual contact between spoke-attachment and sensor. But these were not always reliable either, due to magnets weakening, slippage on the spoke, tools required for installation, inability to sustain a satisfactory level of tightness, and other reasons.

In view of the above, there exists a need for a magnetic device which overcomes the above mentioned problems in the prior art. This invention addresses this need in the prior art as well as other needs, which will become apparent to those skilled in the art from this disclosure.

SUMMARY OF THE INVENTION

One object of the present invention is to provide a magnetic device that is relatively easy to install on a spoke such that the magnetic device does not rotate or move longitudinally along the axis of the spoke.

Another object of the present invention is to provide a magnetic device that is inexpensive to manufacture.

Another object of the present invention is to provide a magnetic device that can be installed in one step.

Another object of the present invention is to provide a magnetic device that requires no tools for installation.

5 Another object of the present invention is to provide a magnetic device that can be used with a non-circular cross-section.

Another object of the present invention is to provide a bracket assembly for mounting on a spoke having at least one flat portion, comprising a housing having a flat spoke-receiving recess with non-circular cross section and at least one detent
10 extending from the housing into the flat spoke-receiving recess to secure the at least one flat portion of the spoke within the spoke-receiving recess via a snap-fit.

The foregoing objects basically can be obtained by providing a magnetic device that mounts on a flat portion of a spoke of a wheel. This magnetic device basically comprises a housing with magnetic material fixedly coupled to the housing.
15 The housing can have a spoke-receiving recess with a non-circular cross section, and at least one detent. The detent extends from the housing into the spoke-receiving recess to secure a flat spoke within the spoke-receiving recess via a snap-fit.

The foregoing objects can also basically be obtained by providing a magnetic device that mounts on a flat spoke of a wheel, as described above. The magnetic
20 device communicates with a sensing device, which is adapted to be coupled to a portion of the bicycle that is adjacent to a wheel of the bicycle. A display unit, adapted to be mounted on handlebars of the bicycle, displays the speed information obtained from the sensing device.

Another object of the present invention is to provide a monitoring device for
25 mounting on a spoke having at least one flat portion, comprising a housing having a spoke-receiving recess with a pair of opposed side walls spaced apart by a first predetermined distance and defining a non-circular cross section to receive the at least one flat portion of the spoke therebetween, the side walls being constructed of an elastic material to elastically retain the at least one flat portion of the spoke
30 therebetween, the first predetermined distance being slightly smaller than a predetermined width of the flat portion of the spoke to elastically deform the side walls.

Another object of the present invention is to provide a magnetic device for mounting on a spoke having at least one flat portion, comprising a housing having a spoke-receiving recess with a pair of opposed side walls spaced apart by a first predetermined distance and defining a non-circular cross section to receive the at least one flat portion of the spoke therebetween, the side walls being constructed of an elastic material to elastically retain the at least one flat portion of the spoke therebetween, the first predetermined distance being slightly smaller than a predetermined width of the flat portion of the spoke to elastically deform said the walls; and a magnetic material fixedly coupled to the housing.

Another object of the present invention is to provide a monitoring device for a bicycle, comprising a sensing device; adapted to be coupled to a portion of the bicycle that is adjacent a wheel of the bicycle; a display unit adapted to be mounted on handlebars of the bicycle; and a magnetic device adapted to be mounted on wheel spokes having a flat portion, the magnetic device including a housing and magnetic material fixedly coupled to the housing, the housing having a spoke-receiving recess with a pair of opposed side walls spaced apart by a first predetermined distance and defining a non-circular cross section to receive the at least one flat portion of the spoke therebetween, the side walls being constructed of an elastic material to elastically retain the at least one flat portion of the spoke therebetween, the first predetermined distance being slightly smaller than a predetermined width of the flat portion of the spoke to elastically deform the side walls.

Another object of the present invention is to provide a bracket assembly for mounting on a spoke having at least one flat portion, comprising a housing having a spoke-receiving recess with a pair of opposed side walls spaced apart by a first predetermined distance to retain the spoke therebetween, and a projection extending from the spoke-receiving recess to engage the concavity of the spoke within the spoke-receiving recess.

Another object of the present invention is to provide a magnetic device for mounting on a spoke with a concavity, comprising a housing having a spoke-receiving recess with a pair of opposed side walls spaced apart by a first predetermined distance to retain the spoke therebetween, and a projection extending

from the spoke-receiving recess to engage the concavity of the spoke within the spoke-receiving recess; and a magnetic material fixedly coupled to the housing.

Another object of the present invention is to provide a monitoring device for a bicycle, comprising a sensing device; adapted to be coupled to a portion of the bicycle that is adjacent a wheel of the bicycle; a display unit adapted to be mounted on handlebars of the bicycle; and a magnetic device adapted to be mounted on wheel spokes having a flat portion, the magnetic device including a housing and magnetic material fixedly coupled to the housing, the housing having a spoke-receiving recess with a pair of opposed side walls spaced apart by a first predetermined distance to retain the spoke therebetween, and a projection extending from the spoke-receiving recess to engage the concavity of the spoke within the spoke-receiving recess.

These and other objects, features, aspects and advantages of the present invention will become apparent to those skilled in the art from the following detailed description, which, taken in conjunction with the annexed drawings, discloses a preferred embodiment of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the attached drawings which form a part of this original disclosure:

Figure 1 is a side elevational view of a bicycle with a monitoring device mounted thereto in accordance with the present invention;

Figure 2 is a partial front perspective view of a magnetic device mounted on a flat spoke in accordance with a first embodiment of the present invention;

Figure 3 is a partial rear perspective view of the magnetic device illustrated in Figure 2, while mounted on a flat spoke;

Figure 4 is a front elevational view of the housing of the magnetic device illustrated in Figures 2 and 3;

Figure 5 is a rear elevational view of the housing of the magnetic device illustrated in Figures 3-4;

Figure 6 is an end elevational view of the housing of the magnetic device illustrated in Figures 2-5;

Figure 7 is a front elevational view of a flat spoke that is used with the magnetic device illustrated in Figures 2-6;

Figure 8 is a side elevational view of the flat spoke illustrated in Figure 7;

Figure 9 is a partial front perspective view of a magnetic device mounted on a flat portion of a spoke in accordance with a second embodiment of the present invention;

5 Figure 10 is a partial rear perspective view of the magnetic device illustrated in Figure 9, while mounted on the flat portion of the spoke;

Figure 11 is an end elevational view of the housing of the magnetic device illustrated in Figures 9 and 10;

10 Figure 12 is a partial perspective view of a portion of the spoke that is used in the second embodiment of the present invention;

Figure 13 is a front elevational view of a magnetic device in accordance with a third embodiment of the present invention;

Figure 14 is a rear elevational view of the housing of the magnetic device illustrated in Figures 13;

15 Figure 15 is an end elevational view of the housing of the magnetic device illustrated in Figures 13 and 14;

Figure 16 is a front elevational view of a spoke that is used with the magnetic device illustrated in Figures 13-15;

Figure 17 is a side elevational view of the spoke illustrated in Figure 16;

20 Figure 18 is a front elevational view of a magnetic device in accordance with a fourth embodiment of the present invention;

Figure 19 is a rear elevational view of the housing of the magnetic device illustrated in Figures 18;

25 Figure 20 is an end elevational view of the housing of the magnetic device illustrated in Figures 18 and 19;

Figure 21 is a front elevational view of a spoke that is used with the magnetic device illustrated in Figures 18-20;

Figure 22 is a side elevational view of the spoke illustrated in Figure 21.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

30 Referring initially to Figure 1, a bicycle 10 is illustrated with a monitoring device 12 mounted thereon in accordance with the present invention. Bicycles and their various components are well known in the art, and thus, bicycle 10 and its

various components will not be discussed or illustrated in detail herein except for the components that relate to the present invention. In other words, only monitoring device 12 and the components of bicycle 10 relating thereto will be discussed and/or illustrated herein.

5 Bicycle 10 basically includes a frame 14, a pair of wheels 16 and handlebar 17. The bicycle frame 14 has handlebar 18 movably attached thereto for turning front wheel 16. Each of the wheels 16 are conventional wheels that are rotatably coupled to frame 14 in a conventional manner. Each of the wheels 16 has a hub 18, a plurality of spokes 19 and a rim 20. Spokes 19 of each of the wheels 16 extend between hub 18
10 and rim 20. While the hubs 18 for the wheels 16 are different in the front and rear wheels, these differences are not important to this invention.

 Spoke 19 has first attachment end 21, second attachment end 22 and a connecting portion 23 extending therebetween. First attachment end 21 can be adapted to be coupled to the corresponding structure of the hub 18. First attachment
15 end 21 is threaded as shown in Figures 7 and 8. Second attachment end 22 has a head 27 in the shape of a bent nail head as shown in Figure 6. Second attachment end 22 can be adapted to be coupled to rim 20 of wheel 16. However, flat spoke 19 can be reversed, so that first attachment end 21 is coupled to rim 20, and second attachment end is coupled to hub 18. Connecting portion 23 has a non-circular cross-sectional,
20 preferably substantially elliptical cross-section.

 In this embodiment, as seen in Figures 7 and 8, spokes 19 are so-called flat or aerodynamic spokes. Spokes 19 differ from round spokes in that they have a substantially elliptical cross-section, where that cross-section has rounded ends. The cross-sectional length of flat spoke 19 is preferably around 2.75 millimeters. Flat
25 spokes 19 are aligned along hub 18 of wheel 16 so as to decrease wind resistance. This decrease in wind resistance is due to the flattened surface of spoke 19 which lies in the same center plane as wheel 16. Thus, flat spokes 19 are very desirable in bicycle riding.

 Monitoring device 12 is adapted to be fixedly coupled to frame 14, handlebar
30 17 and one of the spokes 19 of one of the wheels 16. In this first embodiment, monitoring device 12 is especially designed for mounting on spoke 19 that has a portion with a non-circular cross-section.

5 The monitoring device 12 basically includes four parts. In particular,
monitoring device 12 basically includes a display unit 24, a wire 25, a sensor 26 and a
magnetic device 28. All of the parts are basically conventional parts that are well
known in the bicycle art, except for magnetic device 28 which is the subject of the
present invention. Therefore, the display unit 24, wire 25 and sensor 26 will not be
discussed or illustrated in detail herein. One example of a prior art monitoring device
is disclosed in U.S. Patent No. 5,264,791, which is assigned to Cat Eye Incorporated.
This U.S. patent is hereby incorporated herein by reference for the purpose of
understanding one particular use of the magnetic device 28 in accordance with the
present invention. Accordingly, display unit 24 mentioned above can be of the type
mentioned in this U.S. patent or any other prior art device. Similarly, the sensor 26
can be a reed switch or any other type of magnetic sensor that is known in the art.

10 Magnetic device 28 basically includes a magnet 30 and housing 32. Housing
32 is integrally formed as a one-piece unitary member, preferably of lightweight
material. For example, housing 32 can be molded as a one-piece, unitary member
from plastic types of materials that can accomplish the essence of the present
invention. Housing 32 can also be referred to as a bracket assembly. Housing 32 can
alternatively be made of magnetic or magnetized material, and thus, eliminate the
need for a separate magnet 30. For example, housing 32 can be constructed of a
plastic material with magnetic particles embedded therein. In any case, the
construction of the material for housing 32 of magnetic device 28 is preferably
lightweight. Magnetic device 28 should have a magnetism that is strong enough to
operate sensor 26 without difficulty during rotation of wheel 16.

25 Housing 32 has a body portion 34 and two retaining portions 36 extending
from body portion 34. Body portion 34 can be cylindrical in shape. Housing 32 is
preferably constructed of a lightweight material such as a resilient plastic. Housing
32 should be of a resilient material to releasably couple spoke 19 thereto. Body
portion 34 has a cylindrical cavity 37 for holding magnet 30, with two semi-circular
flanges 38 formed at the open end of cavity 37. Semi-circular flanges 38 are arranged
to receive a portion of spoke 19 therebetween when housing 32 is completely installed
on one of the spokes 19, and are molded in such a way as to be less likely to break off
during handling of housing 32.

66220-445560

The two retaining portions 36 are integrally formed with body portion 34 and extend in opposite directions from body portion 34. In other words, retaining portions 36 are integrally formed with body portion 34 as a one-piece, unitary member. Retaining portions 36 are channel-shaped to form a spoke-receiving recess 39. Each of the retaining portions 36 has a bottom wall 40 and two side walls 42.

Each bottom wall 40 of each retaining portion 36 has an aperture 43 for decreasing weight of housing 32, and increasing flexibility. The two side walls 42 and bottom wall 40 extend outward from body portion 34. Side walls 42 are substantially parallel to each other and also extend substantially perpendicular to the bottom wall 40. Side walls 42 are spaced apart from each other by a predetermined distance B except along detents 48.

Side walls 42 have detents 48 for holding and securing flat spoke 19 via a snap-fit. Preferably, each side wall 42 has two detents 48 that are longitudinally spaced apart from each other along spoke-receiving recess 35. Each detent 48 has a curved outer surface 52 for inserting flat spoke 19. Each detent 48 also has an inner retaining surface 54. Side walls 42 and detents 48 form an opening 46 through which flat spoke 19 can be inserted beneath detents 48. Each retaining portion 36 is flexible so that it can move slightly outwardly to expand the spoke-receiving recess 39 as flat spoke 19 passes into opening 46. The opposing detents 48 are separated from each other by a predetermined distance C.

Bottom wall 40, side walls 42, and the two detents 48 together form a spoke-receiving recess 39. This spoke-receiving recess 39 has a cross-sectional shape of an oval or racetrack, with rounded ends 56, as shown in Figure 6. Spoke-receiving recess 39 preferably has a length between approximately 10 millimeters and 30 millimeters, preferably around 18 millimeters.

After the flat portion of spoke 19 is initially inserted into spoke-receiving recess 39, housing 32 is then rotated about the axis of flat spoke 19, so that the rounded ends 56 match up with rounded ends of spoke 19. This matching up of surfaces, in combination with inner retaining surface 54 of detent 48, acts to snap-fit spoke 19 into spoke-receiving recess 50. Alternatively, housing 32 can be made of a more elastic material, so that detents 48 could become optional, and the snap-fit is replaced by an elastic fit as in a subsequent embodiment discussed below.

66220-1163360

The bottom wall 40 is spaced from inner retaining surfaces 54 by a predetermined distance A. It is an important feature of this invention that, as shown in Figure 6, distance A be less than distance B, so that housing 32 will more accurately fit the shape of spoke 19. This results in housing 32 not rotating about the axis of the spoke 19, and also orients housing 32 to activate sensor 26.

As shown in Figure 6, opening 46 (distance C) is smaller than spoke-receiving recess 39 (distance B). This contributes to the snap-fit of housing 32 around the flat portion of spoke 19. Also, housing 32 will have a reduced tendency to work loose from the flat portion of spoke 19, and will remain in place more effectively.

During installation, housing 32 is pressed against spoke 19. At first, detents 48 resist the centerward motion of flat spoke 19, but being made of flexible plastic, can yield to a slight degree. Also, each detent 48 has a curved outer surface which assists in the flat portion of spoke 19 passing through opening 46. While the installer exerts pressure on housing 32 during installation, detents 48 are forced radially outward from the center axis of spoke-receiving recess 39. After the flat portion of spoke 19 passes by detents 48, side walls 42 spring back to return to their original positions. In doing so, inner retaining surfaces 54 engage the flat portion of spoke 19 to hold spoke 19 against the bottom wall 40 of the spoke-receiving recess 39 with a slight pressing force. Thus, housing 32 is frictional retained on spoke 19 to substantially prevent longitudinal movement of magnetic device 12 along the longitudinal axis of spoke 19.

Because housing 32 is snap-fitted, secured by detents 48 applying continual pressure, and very light in weight, no further securing means, such as a screw or a cover, is necessary. Another advantage is that housing 32 is less likely than conventional art to rotate out of position during use, because rounded ends of spoke-receiving recess 39 can more effectively grip rounded ends of flat spoke 19. Also, because of its snap-fit characteristics, housing 32 can be installed in one step, and requires no tools for installation.

SECOND EMBODIMENT

Referring now to Figures 9-12, a magnetic device 128 is illustrated in accordance with another embodiment of the present invention. In view of the similarities between this embodiment and the prior embodiment, this embodiment will

not be discussed or illustrated in detail. Rather, it will be apparent to those skilled in the art from this disclosure that the most of the parts and descriptions of the prior embodiments also apply to the similar or identical parts of this embodiment.

In a second embodiment, housing 132 is constructed of an elastic material, and detents 148 are optional. The term "elastic" as used hereinafter can include materials with some plastic deformation. In any event, the elastic material should substantially return to its initial form or state after being deformed. Thus, magnetic device 128 can be repeatedly installed, removed, and reinstalled, without significantly affecting the shape of housing 132.

Referring initially to Figure 10, the magnetic device 128 can comprise a magnet 130 and housing 132. As stated, housing 132 is constructed of a lightweight elastomeric material, having elastic properties.

As shown in Figure 11, the cross-sectional length B' of spoke-receiving recess is slightly smaller than the cross-sectional width D of the flat portion of spoke 119.

For example, length or distance B' is approximately 2.5 millimeters and the flat portion of spoke 119 has a cross-sectional width D of approximately 2.75 millimeters. Accordingly, housing 132 elastically grips the flat portion of spoke 119. Thus, housing 132 will remain in place more effectively.

Housing 132 is integrally formed as a one-piece unitary member, preferably of lightweight material. For example, housing 132 can be molded as a one-piece, unitary member from an elastomeric material that can accomplish the essence of the present invention. Housing 132 can also be referred to as a bracket assembly. Housing 132 can alternatively be made of magnetic or magnetized material, and thus, eliminate the need for a separate magnet 130. For example, housing 132 can be constructed of an elastomeric material with magnetic particles embedded therein. Magnetic device 128 should have a magnetism that is strong enough to operate sensor 26 without difficulty during rotation of wheel 16.

Housing 132 has a body portion 134 and two retaining portions 136 extending from body portion 134. Body portion 134 can be cylindrical in shape. Housing 132 should be of a resilient material to releasably couple spoke 119 thereto. Body portion 134 has a cavity 137 for holding magnet 130, with two semi-circular flanges 138 formed at the open end of cavity 137. Semi-circular flanges 138 are arranged to

receive a flat portion of spoke 119 therebetween when housing 132 is completely installed on one of the spokes 119. Retaining portions 136 are channel-shaped to form a spoke-receiving recess 139. Each of the retaining portions 136 has a bottom wall 140 and two side walls 142.

5 Each bottom wall 140 of each retaining portion 136 has an aperture 143 for decreasing weight of housing 132, and increasing flexibility. The two side walls 142 and bottom wall 140 extend outward from body portion 134. Side walls 142 are substantially parallel to each other and also extend substantially perpendicular to the bottom wall 140. Side walls 142 are spaced apart from each other by a predetermined
10 distance B except along detents 148.

Side walls 142 can optionally have detents 148 for further holding and securing flat surface of spoke 19 via an elastic fit. Preferably, each side wall 142 has two detents 148 that are longitudinally spaced apart from each other along spoke-receiving recess 35. Each detent 148 has a curved outer surface 152 for inserting
15 spoke 119. Each detent 148 also has an inner retaining surface 154. Side walls 142 and detents 148 form an opening 146 through which spoke 119 can be inserted beneath detents 148. Each retaining portion 136 is flexible so that it can move slightly outwardly to expand the spoke-receiving recess 139 as flat surface of spoke 119 passes into opening 146.

20 Bottom wall 140 and side walls 142 and the two detents 148 together form a spoke-receiving recess 139. This spoke-receiving recess 139 has a cross-sectional shape of an oval or racetrack, with rounded ends 156, as shown in Figure 11. Spoke-receiving recess 139 preferably has a length between approximately 10 millimeters and 30 millimeters, preferably around 18 millimeters. Detents 48 are optional in this
25 embodiment since that spoke 119 is held within spoke-receiving recess 139 by an elastic fit.

The bottom wall 140 is spaced from inner retaining surfaces 154 by a predetermined distance A. As shown in Figure 11, distance A be less than distance B', so that housing 132 will more accurately fit the shape of flat portion of spoke 119.
30 This prevents housing 132 from rotating about the axis of the spoke 119, and also orients housing 132 to activate sensor 26.

As shown in Figure 11, opening 146 (distance C) is smaller than spoke-receiving recess 139 (distance B'). This contributes to the elastic fit of housing 132 around flat portion of spoke 119. Thus, housing 132 will have a reduced tendency to work loose from the flat portion of spoke 119, and will remain in place more effectively.

Also, as shown in Figures 11 and 12, cross-sectional length of flat section of spoke 119 (distance D) is larger than distance B'. Distance D is preferably around 2.75 millimeters, and distance B' is preferably around 2.5 millimeters. Because spoke-receiving recess 139 is smaller than spoke 119, the elastic properties of housing 132 will cause side walls 142 to push against flat surface of spoke 119. This will increase the gripping force of housing 132 on flat surface of spoke 119.

THIRD EMBODIMENT

Referring now to Figures 13-17, a magnetic device 238 is illustrated in accordance with another embodiment of the present invention. Magnetic device 228 is designed to be used with monitoring device 12 of Figure 1. This third embodiment of the magnetic device 228 is substantially identical to the prior embodiments, except that a projection 257 is provided on the housing 232 and the spoke 219 is provided with a concavity 258. For example, housing 232 can be dimensioned to have a snap-fit configuration or an elastic fit configuration. Also, magnetic device 228 of this embodiment can be used with a variety of spokes, e.g., round, elliptical or flat. In view of the similarities between this embodiment and the prior embodiment, this embodiment will not be discussed or illustrated in detail. Rather, it will be apparent to those skilled in the art from this disclosure that the various parts and descriptions of the prior embodiments apply to the similar or identical parts of this embodiment.

Housing 232 can have magnet 230, body portion 234, and retaining portions 236. Retaining portions 236 are channel-shaped to form a spoke-receiving recess 239. Each of the retaining portions 236 has a bottom wall 240 and two side walls 242. Bottom wall 240, side walls 242, and two detents 248 together form spoke-receiving recess 239. This spoke-receiving recess 239 has a cross-sectional shape of an oval or racetrack, with rounded ends 256, as shown in Figure 15. Housing 232 also has a projection 257 formed from bottom wall 240 of one of the retaining portions 236. The projection 257 extends outward approximately 0.7 millimeters. Spoke 219 has a

various changes and modifications can be made herein without departing from the scope of the invention as defined in the appended claims. Furthermore, the foregoing description of the embodiments according to the present invention are provided for illustration only, and not for the purpose of limiting the invention as defined by the
5 appended claims and their equivalents.

66220" 4459260

WHAT IS CLAIMED IS:

1. A bracket assembly for mounting on a spoke having at least one flat portion, comprising:

5 a housing having a flat spoke-receiving recess with non-circular cross section and at least one detent extending from said housing into said flat spoke-receiving recess to secure the at least one flat portion of the spoke within said spoke-receiving recess via a snap-fit.

10 2. A bracket assembly according to claim 1, wherein said housing includes a body portion with a cavity adapted to receive a magnet within said cavity.

15 3. A bracket assembly according to claim 1, wherein said housing further includes a second detent that is longitudinally spaced from said one detent along said spoke-receiving recess.

20 4. A bracket assembly according to claim 3, wherein said housing further includes third and fourth detents with said third detent being located opposite said one detent and said fourth detent being located opposite second detent.

25 5. A bracket assembly according to claim 2, wherein said housing includes a first retaining portion extending from said body portion, said first retaining portion forms at least part of said spoke-receiving recess.

30 6. A bracket assembly according to claim 5, wherein said housing includes a second retaining portion extending from said body portion, said second retaining portion being aligned with said first retaining portion to form at least part of said spoke-receiving recess.

7. A bracket assembly according to claim 6, wherein
said spoke-receiving recess has a length of approximately ten millimeters to
approximately thirty millimeters.

5 8. A bracket assembly according to claim 6, wherein
each of said retaining portions has a pair of side walls extending from a
bottom wall to form said spoke-receiving recess.

10 9. A bracket assembly according to claim 8, wherein
each of said bottom walls has an aperture.

10. A bracket assembly according to claim 1, wherein
said housing is integrally formed as a one-piece, unitary member.

15 11. A bracket assembly according to claim 1, wherein
said housing is constructed of magnetic material.

20 12. A bracket assembly according to claim 1, wherein
said spoke-receiving recess has a pair of side walls extending from a bottom
wall to form an opening to receive the at least one flat portion of the spoke therein.

25 13. A bracket assembly according to claim 12, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, said side walls being spaced apart by a first
predetermined distance at said at least one detent, and portions of said side walls
located between said bottom wall and said retaining surface being spaced apart by a
second predetermined distance, said first predetermined distance being smaller than
said second predetermined distance.

14. A bracket assembly according to claim 13, wherein
said at least one detent has a retaining surface ~~that~~ is opposed to said bottom
wall and spaced from said bottom wall by a third predetermined distance, said third
predetermined distance being smaller than said second predetermined distance.

5

15. A bracket assembly according to claim 12, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, portions of said side walls located between said
bottom wall and said retaining surface being spaced apart by a first predetermined
10 distance, said retaining surface being spaced from said bottom wall by a second
predetermined distance, said first predetermined distance being greater than said
second predetermined distance.

16. A magnetic device for mounting on a spoke having at least one flat
15 portion, comprising:

a housing having a spoke-receiving recess with non-circular cross section and
at least one detent extending from said housing into said spoke-receiving recess to
secure a flat spoke within said spoke-receiving recess via a snap-fit; and
a magnetic material fixedly coupled to said housing.

20

17. A magnetic device according to claim 16, wherein
said housing includes a body portion with a cavity, and said magnetic material
is a magnet that is fixedly secured within said cavity.

25 18. A magnetic device according to claim 16, wherein
said housing further includes a second detent that is longitudinally spaced
from said one detent along said spoke-receiving recess.

30 19. A magnetic device according to claim 18, wherein
said housing further includes third and fourth detents with said third detent
being located opposite said one detent and said fourth detent being located opposite
second detent.

20. A magnetic device according to claim 17, wherein
said housing includes a first retaining portion extending from said body
portion, said first retaining portion forms at least part of said spoke-receiving recess.

5

21. A magnetic device according to claim 20, wherein
said housing includes a second retaining portion extending from said body
portion, said second retaining portion being aligned with said first retaining portion to
form at least part of said spoke-receiving recess.

10

22. A magnetic device according to claim 21, wherein
said spoke-receiving recess has a length of approximately ten millimeters to
approximately thirty millimeters.

15

23. A magnetic device according to claim 21, wherein
each of said retaining portions has a bottom wall and a pair of side walls
extending from said bottom wall to form said spoke-receiving recess.

20

24. A magnetic device according to claim 23, wherein
each of said bottom walls has an aperture.

25. A magnetic device according to claim 16, wherein
said housing is integrally formed as a one-piece, unitary member.

25

26. A magnetic device according to claim 16, wherein
said housing is constructed of magnetic material.

30

27. A magnetic device according to claim 16, wherein
said spoke-receiving recess is formed by a pair of side walls extending from a
bottom wall to form an opening between said side walls to insert the spoke into said
spoke-receiving recess.

28. A magnetic device according to claim 27, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, said side walls being spaced apart by a first
predetermined distance at said at least one detent, and portions of said side walls
5 located between said bottom wall and said retaining surface being spaced apart by a
second predetermined distance, said first predetermined distance being smaller than
said second predetermined distance.

29. A magnetic device according to claim 28, wherein
10 said at least one detent has an retaining surface that is opposed to said bottom
wall and spaced from said bottom wall by a third predetermined distance, said third
predetermined distance being smaller than said second predetermined distance.

30. A magnetic device according to claim 27, wherein
15 said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, portions of said side walls located between said
bottom wall and said retaining surface being spaced apart by a first predetermined
distance, said retaining surface being spaced from said bottom wall by a second
predetermined distance, said first predetermined distance being greater than said
20 second predetermined distance.

31. A monitoring device for a bicycle, comprising:
a sensing device; adapted to be coupled to a portion of the bicycle that is
adjacent a wheel of the bicycle;
25 a display unit adapted to be mounted on handlebars of the bicycle; and
a magnetic device adapted to be mounted on a spoke having a flat portion, said
magnetic device including a housing and magnetic material fixedly coupled to said
housing,
said housing having a spoke-receiving recess with non-circular cross section
30 and at least one detent extending from said housing into said spoke-receiving recess to
secure a flat spoke within said spoke-receiving recess via a snap-fit.

32. A monitoring device according to claim 31, wherein
said housing includes a body portion with a cavity, and said magnetic material
is a magnet that is fixedly secured within said cavity.

5 33. A monitoring device according to claim 31, wherein
said housing further includes a second detent that is longitudinally spaced
from said one detent along said spoke-receiving recess.

10 34. A monitoring device according to claim 32, wherein
said housing further includes third and fourth detents with said third detent
being located opposite said one detent and said fourth detent being located opposite
second detent.

15 35. A monitoring device according to claim 32, wherein
said housing includes a first retaining portion extending from said body
portion, said first retaining portion forms at least part of said spoke-receiving recess.

20 36. A monitoring device according to claim 35, wherein
said housing includes a second retaining portion extending from said body
portion, said second retaining portion being aligned with said first retaining portion to
form at least part of said spoke-receiving recess.

25 37. A monitoring device according to claim 36, wherein
said spoke-receiving recess has a length of approximately ten millimeters to
approximately thirty millimeters.

30 38. A monitoring device according to claim 36, wherein
each of said retaining portions has a pair of side walls extending from a
bottom wall to form said spoke-receiving recess.

39. A monitoring device according to claim 38, wherein
each of said bottom walls has an aperture.

40. A monitoring device according to claim 31, wherein
said housing is integrally formed as a one-piece, unitary member.

5 41. A monitoring device according to claim 31, wherein
said housing is constructed of said magnetic material.

42. A monitoring device according to claim 31, wherein
said spoke-receiving recess has a pair of side walls extending from a bottom
10 wall to form an opening to receive the at least one flat portion of the spoke therein.

43. A monitoring device according to claim 42, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, said side walls being spaced apart by a first
15 predetermined distance at said at least one detent, and portions of said side walls
located between said bottom wall and said retaining surface being spaced apart by a
second predetermined distance, said first predetermined distance being smaller than
said second predetermined distance.

20 44. A monitoring device according to claim 43, wherein
said at least one detent has a retaining surface that is opposed to said bottom
wall and spaced from said bottom wall by a third predetermined distance, said third
predetermined distance being smaller than said second predetermined distance.

25 45. A monitoring device according to claim 42, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, portions of said side walls located between said
bottom wall and said retaining surface being spaced apart by a first predetermined
distance, said retaining surface being spaced from said bottom wall by a second
30 predetermined distance, said first predetermined distance being greater than said
second predetermined distance.

46. A monitoring device for mounting on a spoke having at least one flat portion, comprising:

a housing having a spoke-receiving recess with a pair of opposed side walls spaced apart by a first predetermined distance and defining a non-circular cross section to receive the at least one flat portion of the spoke therebetween, said side walls being constructed of an elastic material to elastically retain the at least one flat portion of the spoke therebetween, said first predetermined distance being slightly smaller than a predetermined width of the flat portion of the spoke to elastically deform said side walls.

47. A bracket assembly according to claim 46, wherein said housing further includes a body portion with a cavity adapted to receive a magnet within said cavity.

48. A bracket assembly according to claim 46, wherein one of said side walls of said housing further includes a first detent extending into said spoke-receiving recess.

49. A bracket assembly according to claim 48, wherein said housing further includes a second detent that is longitudinally spaced from said one detent along said spoke-receiving recess.

50. A bracket assembly according to claim 49, wherein said housing further including third and fourth detents with said third detent being located opposite said one detent and said fourth detent being located opposite second detent.

51. A bracket assembly according to claim 46, wherein said housing includes a first retaining portion extending from said body portion, said first retaining portion forms at least part of said spoke-receiving recess.

52. A bracket assembly according to claim 51, wherein
said housing includes a second retaining portion extending from said body
portion, said second retaining portion being aligned with said first retaining portion to
form at least part of said spoke-receiving recess.

5

53. A bracket assembly according to claim 52, wherein
said spoke-receiving recess has a length of approximately ten millimeters to
approximately thirty millimeters.

10

54. A bracket assembly according to claim 52, wherein
each of said retaining portions has a bottom wall located between said side
walls, each of said bottom walls having an aperture.

15

55. A bracket assembly according to claim 46, wherein
said housing is integrally formed as a one-piece, unitary member.

56. A bracket assembly according to claim 46, wherein
said housing is constructed of magnetic material.

20

57. A bracket assembly according to claim 48, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, said side walls being spaced apart by a first
predetermined distance at said at least one detent, and portions of said side walls
located between said bottom wall and said retaining surface being spaced apart by a
second predetermined distance, said first predetermined distance being smaller than
said second predetermined distance.

25

58. A bracket assembly according to claim 57, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
and spaced from said bottom wall by a third predetermined distance, said third
predetermined distance being smaller than said second predetermined distance.

30

59. A bracket assembly according to claim 48, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, portions of said side walls located between said
bottom wall and said retaining surface being spaced apart by a first predetermined
5 distance, said retaining surface being spaced from said bottom wall by a second
predetermined distance, said first predetermined distance being greater than said
second predetermined distance.

60. A magnetic device for mounting on a spoke having at least one flat
10 portion, comprising:
a housing having a spoke-receiving recess with a pair of opposed side walls
spaced apart by a first predetermined distance and defining a non-circular cross
section to receive the at least one flat portion of the spoke therebetween, said side
walls being constructed of an elastic material to elastically retain the at least one flat
15 portion of the spoke therebetween, said first predetermined distance being slightly
smaller than a predetermined width of the flat portion of the spoke to elastically
deform said side walls; and
a magnetic material fixedly coupled to said housing.

61. A magnetic device according to claim 60, wherein
20 said housing further includes a body portion with a cavity adapted to receive a
magnet within said cavity.

62. A magnetic device according to claim 60, wherein
25 one of said side walls of said housing further includes a first detent extending
into said spoke-receiving recess.

63. A magnetic device according to claim 62, wherein
said housing further includes a second detent that is longitudinally spaced
30 from said one detent along said spoke-receiving recess.

64. A magnetic device according to claim 63, wherein
said housing further including third and fourth detents with said third detent
being located opposite said one detent and said fourth detent being located opposite
second detent.

5

65. A magnetic device according to claim 60, wherein
said housing includes a first retaining portion extending from said body
portion, said first retaining portion forms at least part of said spoke-receiving recess.

10

66. A magnetic device according to claim 65, wherein
said housing includes a second retaining portion extending from said body
portion, said second retaining portion being aligned with said first retaining portion to
form at least part of said spoke-receiving recess.

15

67. A magnetic device according to claim 66, wherein
said spoke-receiving recess has a length of approximately ten millimeters to
approximately thirty millimeters.

20

68. A magnetic device according to claim 66, wherein
each of said retaining portions has a bottom wall located between said side
walls, each of said bottom walls having an aperture.

25

69. A magnetic device according to claim 60, wherein
said housing is integrally formed as a one-piece, unitary member.

70. A magnetic device according to claim 60, wherein
said housing is constructed of magnetic material.

30

71. A magnetic device according to claim 62, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, said side walls being spaced apart by a first
predetermined distance at said at least one detent, and portions of said side walls

located between said bottom wall and said retaining surface being spaced apart by a second predetermined distance, said first predetermined distance being smaller than said second predetermined distance.

5 72. A magnetic device according to claim 71, wherein
 said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls and spaced from said bottom wall by a third
predetermined distance, said third predetermined distance being smaller than said
second predetermined distance.

10 73. A magnetic device according to claim 60, wherein
 said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, portions of said side walls located between said
bottom wall and said retaining surface being spaced apart by a first predetermined
15 distance, said retaining surface being spaced from said bottom wall by a second
predetermined distance, said first predetermined distance being greater than said
second predetermined distance.

20 74. A monitoring device for a bicycle, comprising:
 a sensing device; adapted to be coupled to a portion of the bicycle that is
adjacent a wheel of the bicycle;
 a display unit adapted to be mounted on handlebars of the bicycle; and
 a magnetic device adapted to be mounted on wheel spokes having a flat
portion, said magnetic device including a housing and magnetic material fixedly
25 coupled to said housing,
 said housing having a spoke-receiving recess with a pair of opposed side walls
spaced apart by a first predetermined distance and defining a non-circular cross
section to receive the at least one flat portion of the spoke therebetween, said side
walls being constructed of an elastic material to elastically retain the at least one flat
30 portion of the spoke therebetween, said first predetermined distance being slightly
smaller than a predetermined width of the flat portion of the spoke to elastically
deform said side walls.

75. A magnetic device according to claim 74, wherein
said housing further includes a body portion with a cavity adapted to receive a
magnet within said cavity.

5

76. A monitoring device according to claim 74, wherein
one of said side walls of said housing further includes a first detent extending
into said spoke-receiving recess.

10

77. A monitoring device according to claim 76, wherein
said housing further includes a second detent that is longitudinally spaced
from said one detent along said spoke-receiving recess.

15

78. A monitoring device according to claim 77, wherein
said housing further including third and fourth detents with said third detent
being located opposite said one detent and said fourth detent being located opposite
second detent.

20

79. A monitoring device according to claim 74, wherein
said housing includes a first retaining portion extending from said body
portion, said first retaining portion forms at least part of said spoke-receiving recess.

25

80. A monitoring device according to claim 79, wherein
said housing includes a second retaining portion extending from said body
portion, said second retaining portion being aligned with said first retaining portion to
form at least part of said spoke-receiving recess.

30

81. A monitoring device according to claim 80, wherein
said spoke-receiving recess has a length of approximately ten millimeters to
approximately thirty millimeters.

82. A monitoring device according to claim 80, wherein each of said retaining portions has a bottom wall located between said side walls, each of said bottom walls having an aperture.

5 83. A monitoring device according to claim 74, wherein said housing is integrally formed as a one-piece, unitary member.

84. A monitoring device according to claim 74, wherein said housing is constructed of magnetic material.

10

85. A monitoring device according to claim 76, wherein said at least one detent has a retaining surface that is opposed to a bottom wall located between said side walls, said side walls being spaced apart by a first predetermined distance at said at least one detent, and portions of said side walls located between said bottom wall and said retaining surface being spaced apart by a second predetermined distance, said first predetermined distance being smaller than said second predetermined distance.

15

20

86. A monitoring device according to claim 85, wherein said at least one detent has a retaining surface that is opposed to a bottom wall located between said side walls and spaced from said bottom wall by a third predetermined distance, said third predetermined distance being smaller than said second predetermined distance.

25

87. A monitoring device according to claim 74, wherein said at least one detent has a retaining surface that is opposed to a bottom wall located between said side walls, portions of said side walls located between said bottom wall and said retaining surface being spaced apart by a first predetermined distance, said retaining surface being spaced from said bottom wall by a second predetermined distance, said first predetermined distance being greater than said second predetermined distance.

30

88. A bracket assembly for mounting on a spoke having at least one flat portion, comprising:

a housing having a spoke-receiving recess with a pair of opposed side walls spaced apart by a first predetermined distance to retain the spoke therebetween, and a projection extending from said spoke-receiving recess to engage the concavity of the spoke within said spoke-receiving recess.

89. A bracket assembly according to claim 88, wherein said housing further includes a body portion with a cavity adapted to receive a magnet within said cavity.

90. A bracket assembly according to claim 88, wherein one of said side walls of said housing further includes a first detent extending into said spoke-receiving recess.

91. A bracket assembly according to claim 90, wherein said housing further includes a second detent that is longitudinally spaced from said one detent along said spoke-receiving recess.

92. A bracket assembly according to claim 91, wherein said housing further including third and fourth detents with said third detent being located opposite said one detent and said fourth detent being located opposite second detent.

93. A bracket assembly according to claim 88, wherein said housing includes a first retaining portion extending from said body portion, said first retaining portion forms at least part of said spoke-receiving recess.

94. A bracket assembly according to claim 93, wherein said housing includes a second retaining portion extending from said body portion, said second retaining portion being aligned with said first retaining portion to form at least part of said spoke-receiving recess.

95. A bracket assembly according to claim 94, wherein
said spoke-receiving recess has a length of approximately ten millimeters to
approximately thirty millimeters.

5

96. A bracket assembly according to claim 94, wherein
each of said retaining portions has a bottom wall located between said side
walls, each of said bottom walls having an aperture.

10

97. A bracket assembly according to claim 88, wherein
said housing is integrally formed as a one-piece, unitary member.

98. A bracket assembly according to claim 88, wherein
said housing is constructed of magnetic material.

15

99. A bracket assembly according to claim 90, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, said side walls being spaced apart by a first
predetermined distance at said at least one detent, and portions of said side walls
located between said bottom wall and said retaining surface being spaced apart by a
second predetermined distance, said first predetermined distance being smaller than
said second predetermined distance.

20

100. A bracket assembly according to claim 99, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
and spaced from said bottom wall by a third predetermined distance, said third
predetermined distance being smaller than said second predetermined distance.

25

101. A bracket assembly according to claim 90, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, portions of said side walls located between said
bottom wall and said retaining surface being spaced apart by a first predetermined

30

distance, said retaining surface being spaced from said bottom wall by a second predetermined distance, said first predetermined distance being greater than said second predetermined distance.

5 102. A bracket assembly according to claim 90, wherein
said projection is located on a bottom wall between said side walls.

103. A magnetic device for mounting on a spoke with a concavity,
comprising:

10 a housing having a spoke-receiving recess with a pair of opposed side walls
spaced apart by a first predetermined distance to retain the spoke therebetween, and a
projection extending from said spoke-receiving recess to engage the concavity of the
spoke within said spoke-receiving recess; and
a magnetic material fixedly coupled to said housing.

15 104. A magnetic device according to claim 103, wherein
said housing further includes a body portion with a cavity adapted to receive a
magnet within said cavity.

20 105. A magnetic device according to claim 103, wherein
one of said side walls of said housing further includes a first detent extending
into said spoke-receiving recess.

25 106. A magnetic device according to claim 105, wherein
said housing further includes a second detent that is longitudinally spaced
from said one detent along said spoke-receiving recess.

30 107. A magnetic device according to claim 106, wherein
said housing further including third and fourth detents with said third detent
being located opposite said one detent and said fourth detent being located opposite
second detent.

108. A magnetic device according to claim 103, wherein
said housing includes a first retaining portion extending from said body
portion, said first retaining portion forms at least part of said spoke-receiving recess.

5 109. A magnetic device according to claim 108, wherein
said housing includes a second retaining portion extending from said body
portion, said second retaining portion being aligned with said first retaining portion to
form at least part of said spoke-receiving recess.

10 110. A magnetic device according to claim 109, wherein
said spoke-receiving recess has a length of approximately ten millimeters to
approximately thirty millimeters.

15 111. A magnetic device according to claim 109, wherein
each of said retaining portions has a bottom wall located between said side
walls, each of said bottom walls having an aperture.

20 112. A magnetic device according to claim 103, wherein
said housing is integrally formed as a one-piece, unitary member.

113. A magnetic device according to claim 103, wherein
said housing is constructed of magnetic material.

25 114. A magnetic device according to claim 105, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, said side walls being spaced apart by a first
predetermined distance at said at least one detent, and portions of said side walls
located between said bottom wall and said retaining surface being spaced apart by a
second predetermined distance, said first predetermined distance being smaller than
30 said second predetermined distance.

115. A magnetic device according to claim 105, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls and spaced from said bottom wall by a third
predetermined distance, said third predetermined distance being smaller than said
5 second predetermined distance.

116. A magnetic device according to claim 105, wherein
said at least one detent has a retaining surface that is opposed to a bottom wall
located between said side walls, portions of said side walls located between said
10 bottom wall and said retaining surface being spaced apart by a first predetermined
distance, said retaining surface being spaced from said bottom wall by a second
predetermined distance, said first predetermined distance being greater than said
second predetermined distance.

117. A magnetic device according to claim 103, wherein
said projection is located on a bottom wall between said side walls.

118. A monitoring device for a bicycle, comprising:
a sensing device; adapted to be coupled to a portion of the bicycle that is
20 adjacent a wheel of the bicycle;

a display unit adapted to be mounted on handlebars of the bicycle; and
a magnetic device adapted to be mounted on wheel spokes having a flat
portion, said magnetic device including a housing and magnetic material fixedly
coupled to said housing,
25 said housing having a spoke-receiving recess with a pair of opposed side walls
spaced apart by a first predetermined distance to retain the spoke therebetween, and a
projection extending from said spoke-receiving recess to engage the concavity of the
spoke within said spoke-receiving recess.

119. A monitoring device according to claim 118, wherein
said housing further includes a body portion with a cavity adapted to receive a
magnet within said cavity.

5 120. A monitoring device according to claim 118, wherein
one of said side walls of said housing further includes a first detent extending
into said spoke-receiving recess.

10 121. A monitoring device according to claim 120, wherein
said housing further includes a second detent that is longitudinally spaced
from said one detent along said spoke-receiving recess.

15 122. A monitoring device according to claim 121, wherein
said housing further including third and fourth detents with said third detent
being located opposite said one detent and said fourth detent being located opposite
second detent.

20 123. A monitoring device according to claim 118, wherein
said housing includes a first retaining portion extending from said body
portion, said first retaining portion forms at least part of said spoke-receiving recess.

25 124. A monitoring device according to claim 123, wherein
said housing includes a second retaining portion extending from said body
portion, said second retaining portion being aligned with said first retaining portion to
form at least part of said spoke-receiving recess.

30 125. A monitoring device according to claim 124, wherein
said spoke-receiving recess has a length of approximately ten millimeters to
approximately thirty millimeters.

126. A monitoring device according to claim 124, wherein each of said retaining portions has a bottom wall located between said side walls, each of said bottom walls having an aperture.

5 127. A monitoring device according to claim 118, wherein said housing is integrally formed as a one-piece, unitary member.

128. A monitoring device according to claim 118, wherein said housing is constructed of magnetic material.

10 129. A monitoring device according to claim 120, wherein said at least one detent has a retaining surface that is opposed to a bottom wall located between said side walls, said side walls being spaced apart by a first predetermined distance at said at least one detent, and portions of said side walls
15 located between said bottom wall and said retaining surface being spaced apart by a second predetermined distance, said first predetermined distance being smaller than said second predetermined distance.

20 130. A monitoring device according to claim 129, wherein said at least one detent has a retaining surface that is opposed to a bottom wall located between said side walls and spaced from said bottom wall by a third predetermined distance, said third predetermined distance being smaller than said second predetermined distance.

25 131. A monitoring device according to claim 120, wherein said at least one detent has a retaining surface that is opposed to a bottom wall located between said side walls, portions of said side walls located between said bottom wall and said retaining surface being spaced apart by a first predetermined distance, said retaining surface being spaced from said bottom wall by a second
30 predetermined distance, said first predetermined distance being greater than said second predetermined distance.

132. A monitoring device according to claim 118, wherein said projection is located on a bottom wall between said side walls.

MAGNETIC HOLDER FOR A SPOKE

ABSTRACT OF THE DISCLOSURE

A magnetic device mounts on a flat spoke of a wheel. This magnetic device can comprise a magnet and a housing. The housing is coupled to the magnet, and has
5 a spoke-receiving recess with a non-circular cross section, and at least one detent. The detent extends from the housing into the spoke-receiving recess to secure a flat spoke within the spoke-receiving recess via a snap-fit. The magnetic device communicates with a sensing device, which is adapted to be coupled to a portion of the bicycle that is adjacent to a wheel of the bicycle. A display unit, adapted to be
10 mounted on handlebars of the bicycle, displays the speed information obtained from the sensing device. In a second embodiment, the housing is made of a more elastic material, and the detents become optional. In a third embodiment, the spoke-receiving recess of the housing has a projection that engages a concavity form in the connecting portion of the spoke. In a fourth embodiment, the spoke-receiving recess
15 of the housing has a concavity that engages a projection form on the connecting portion of the spoke.

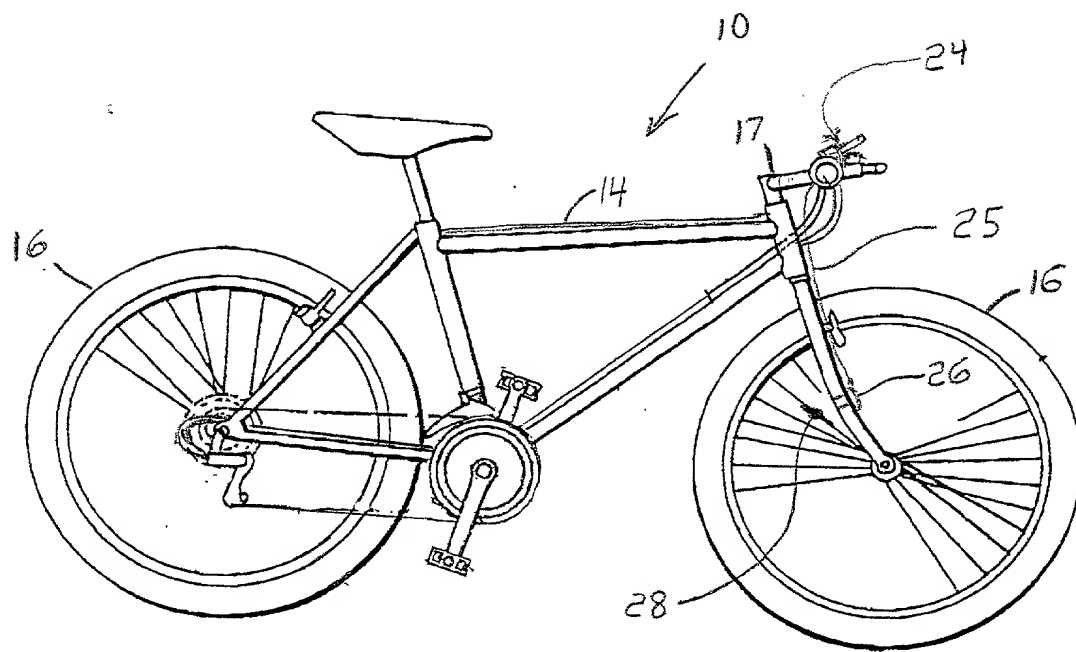


Fig. 1

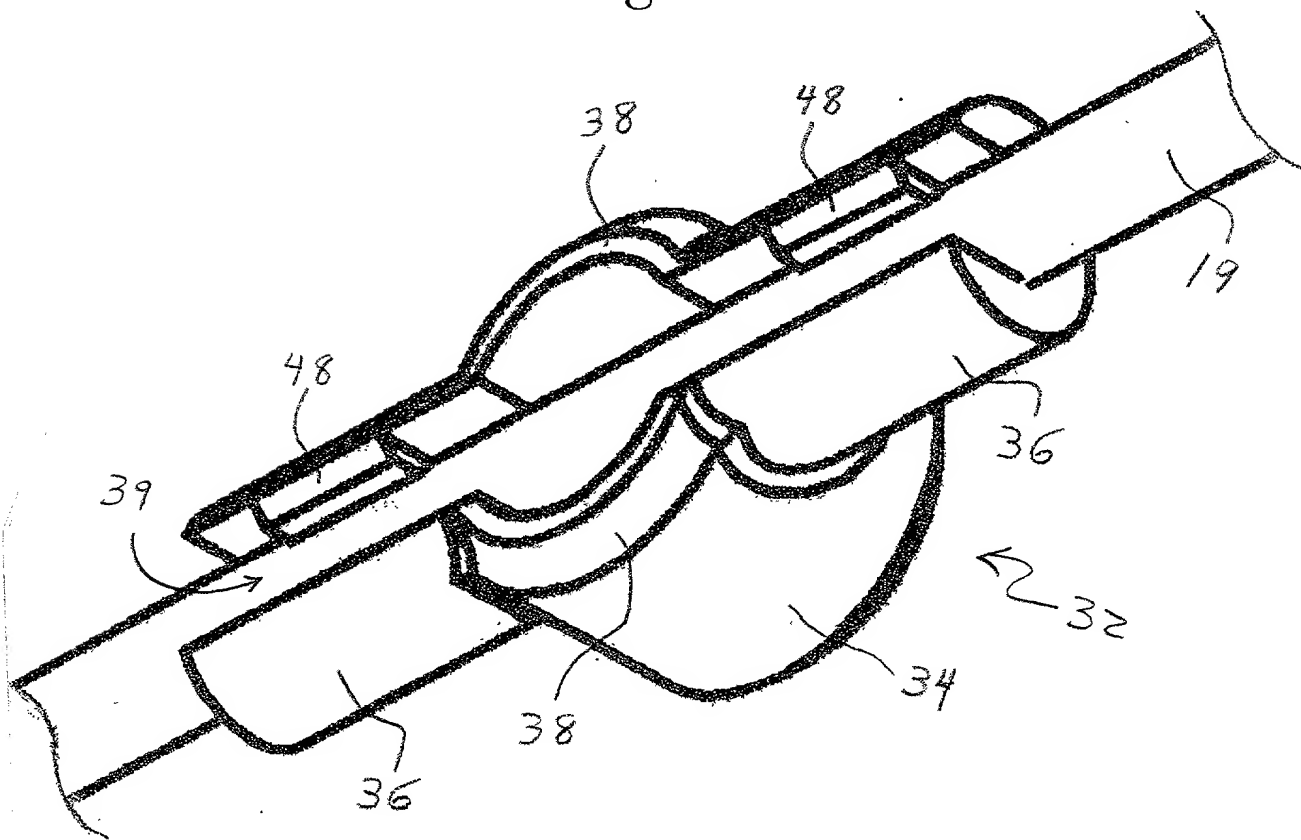


Fig. 2

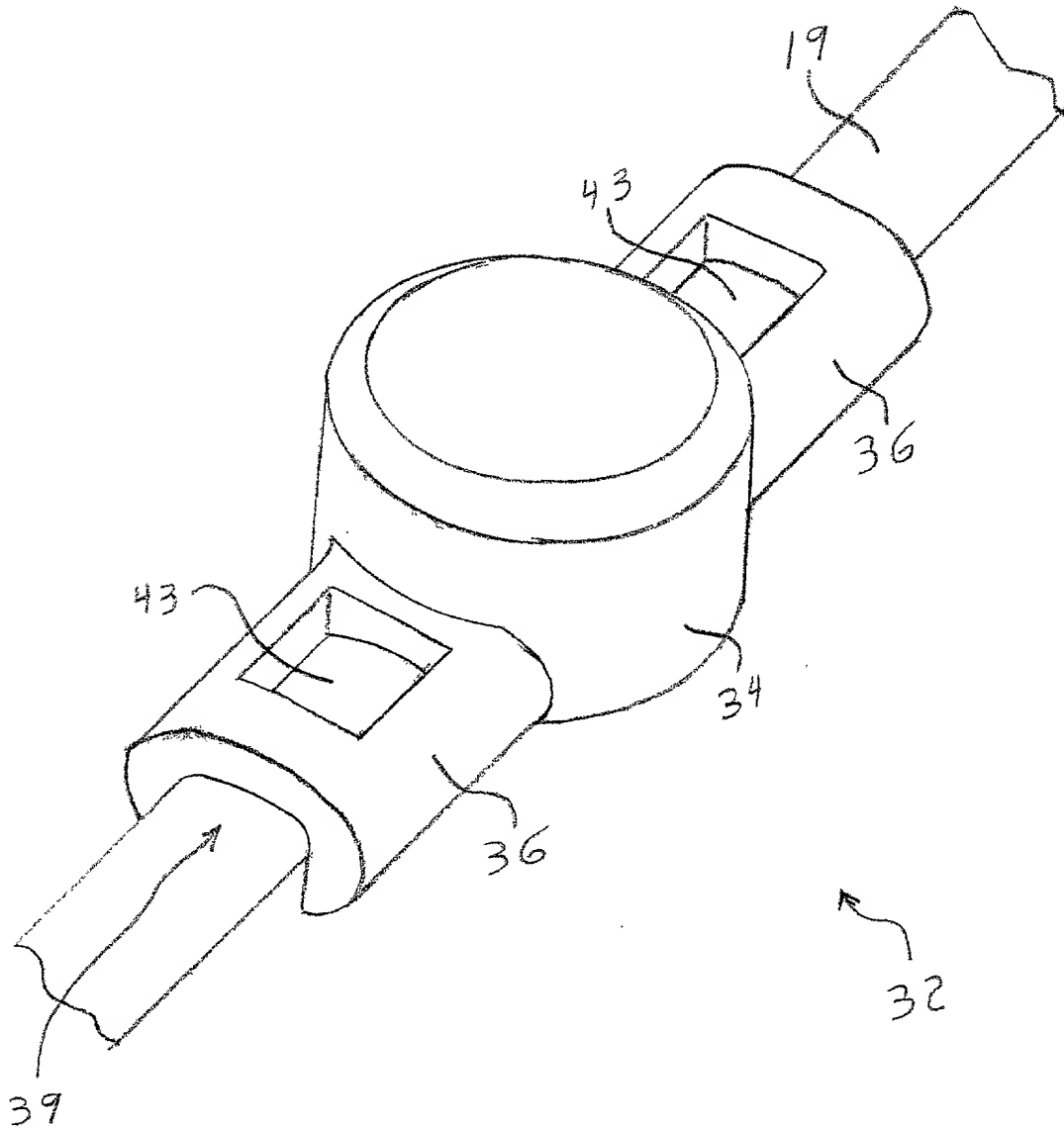


Fig. 3

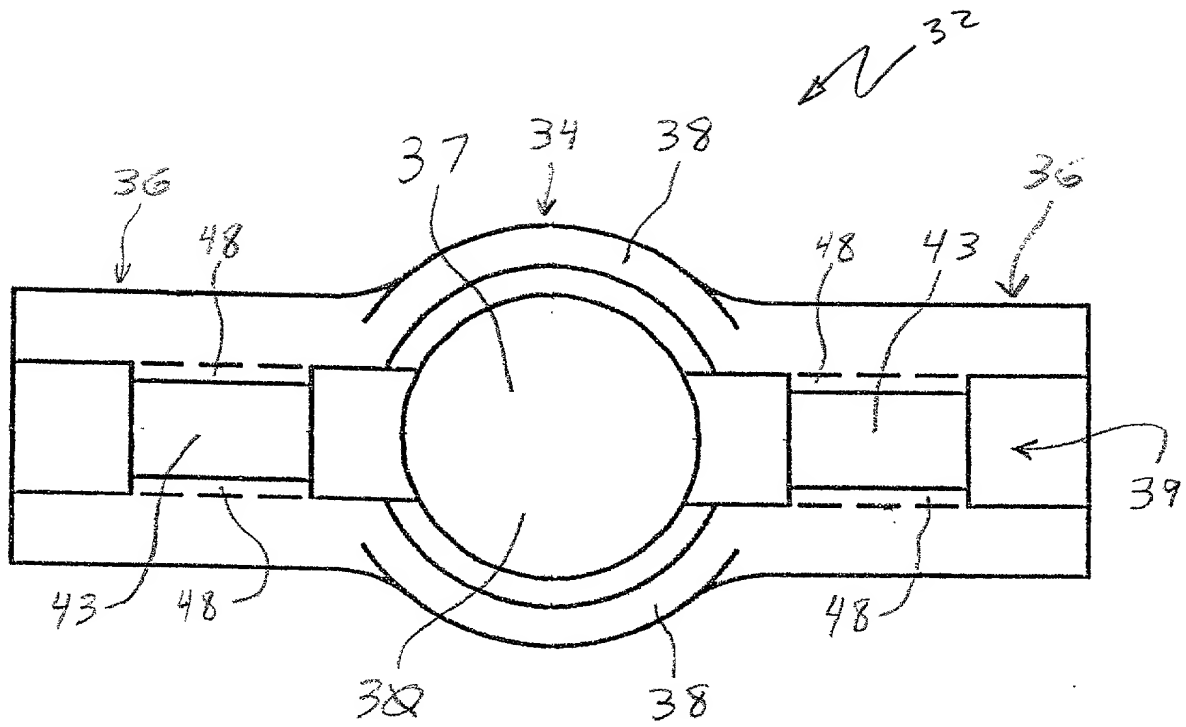


Fig. 4

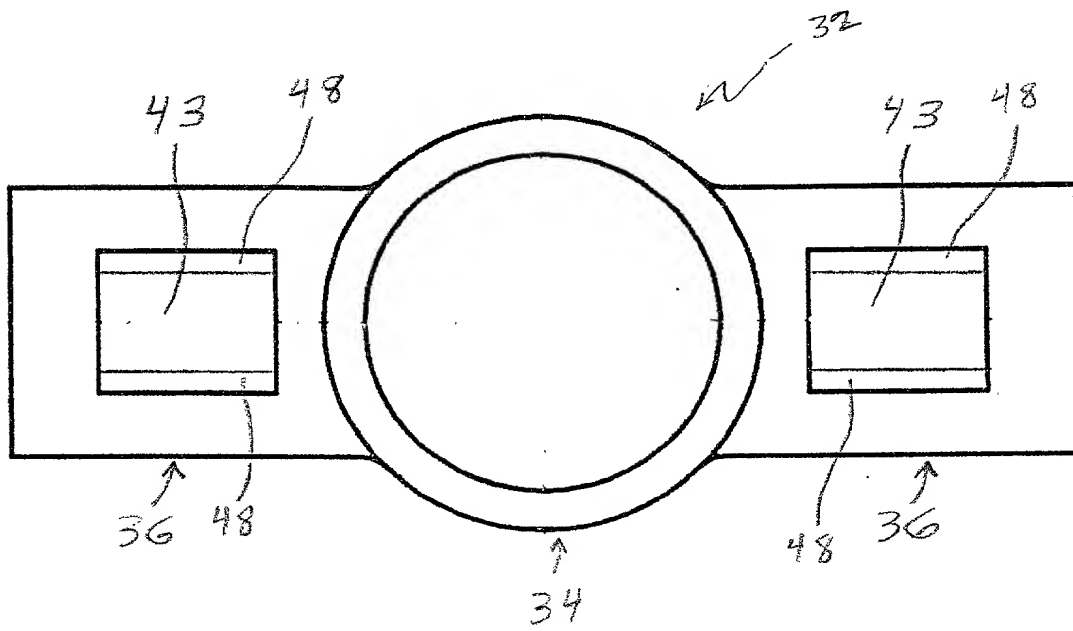
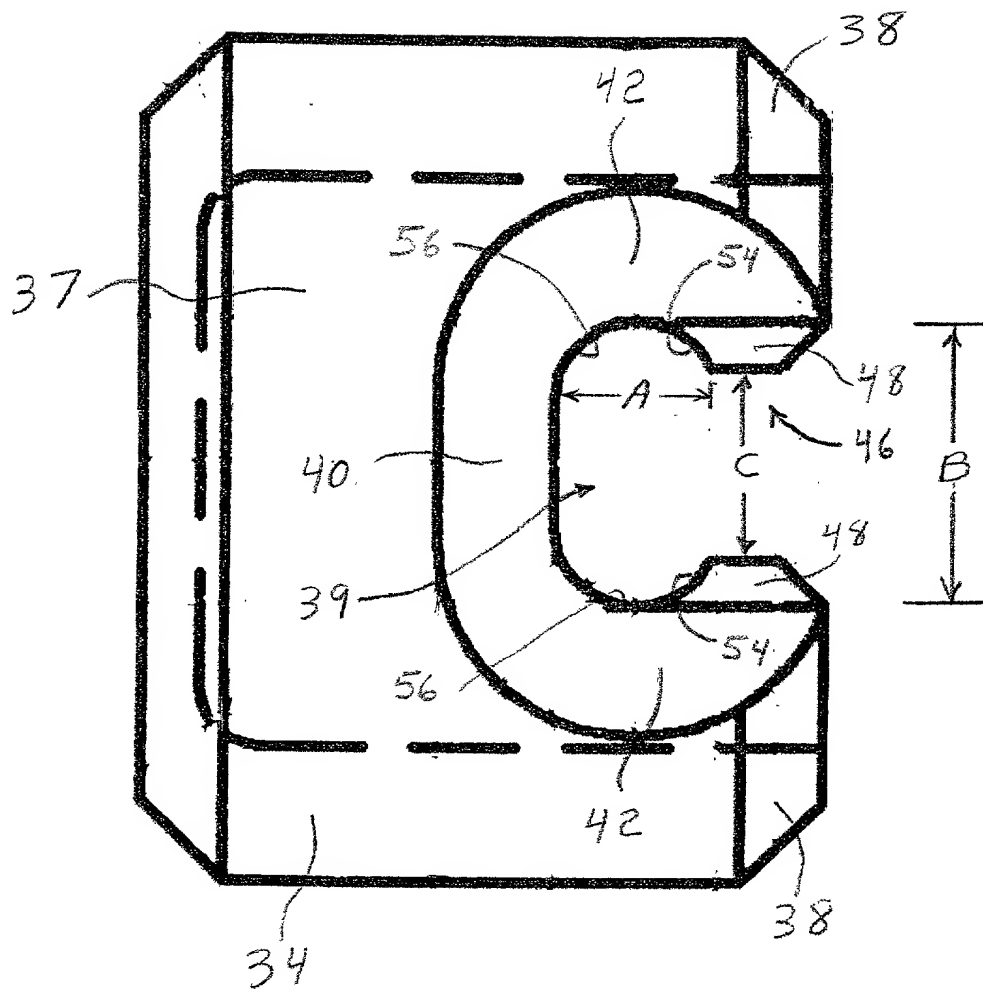


Fig. 5



32

Fig. 6

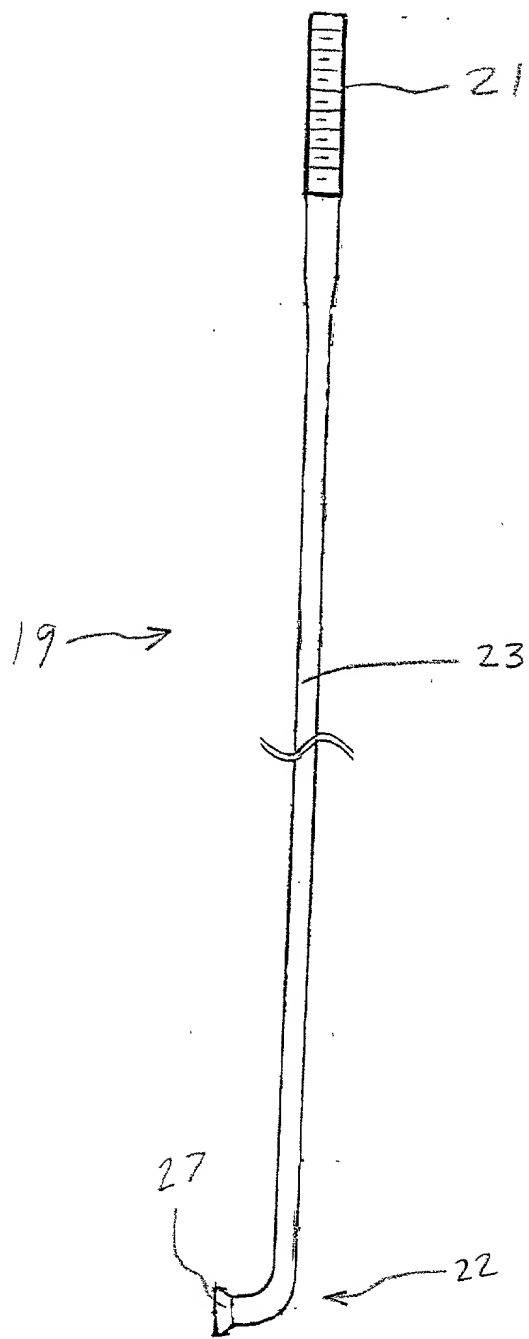


Fig. 7

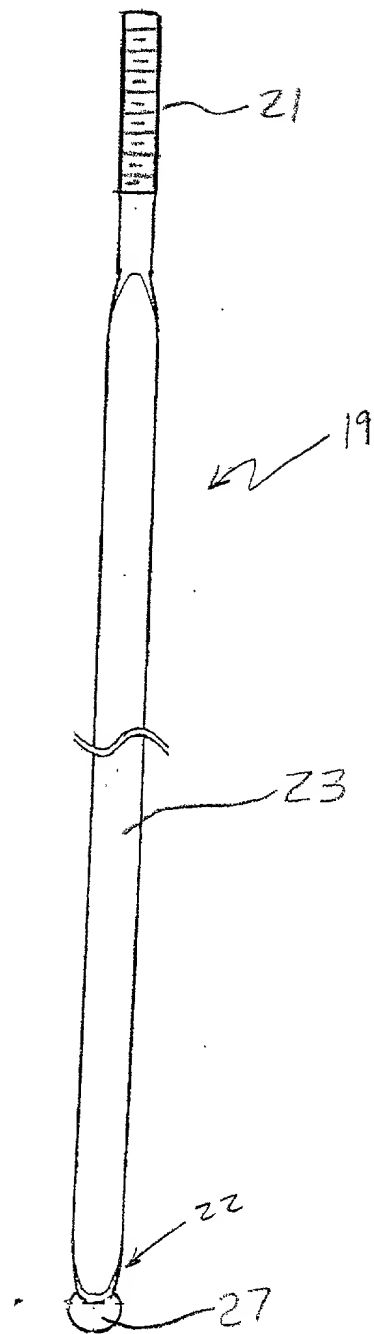


Fig. 8

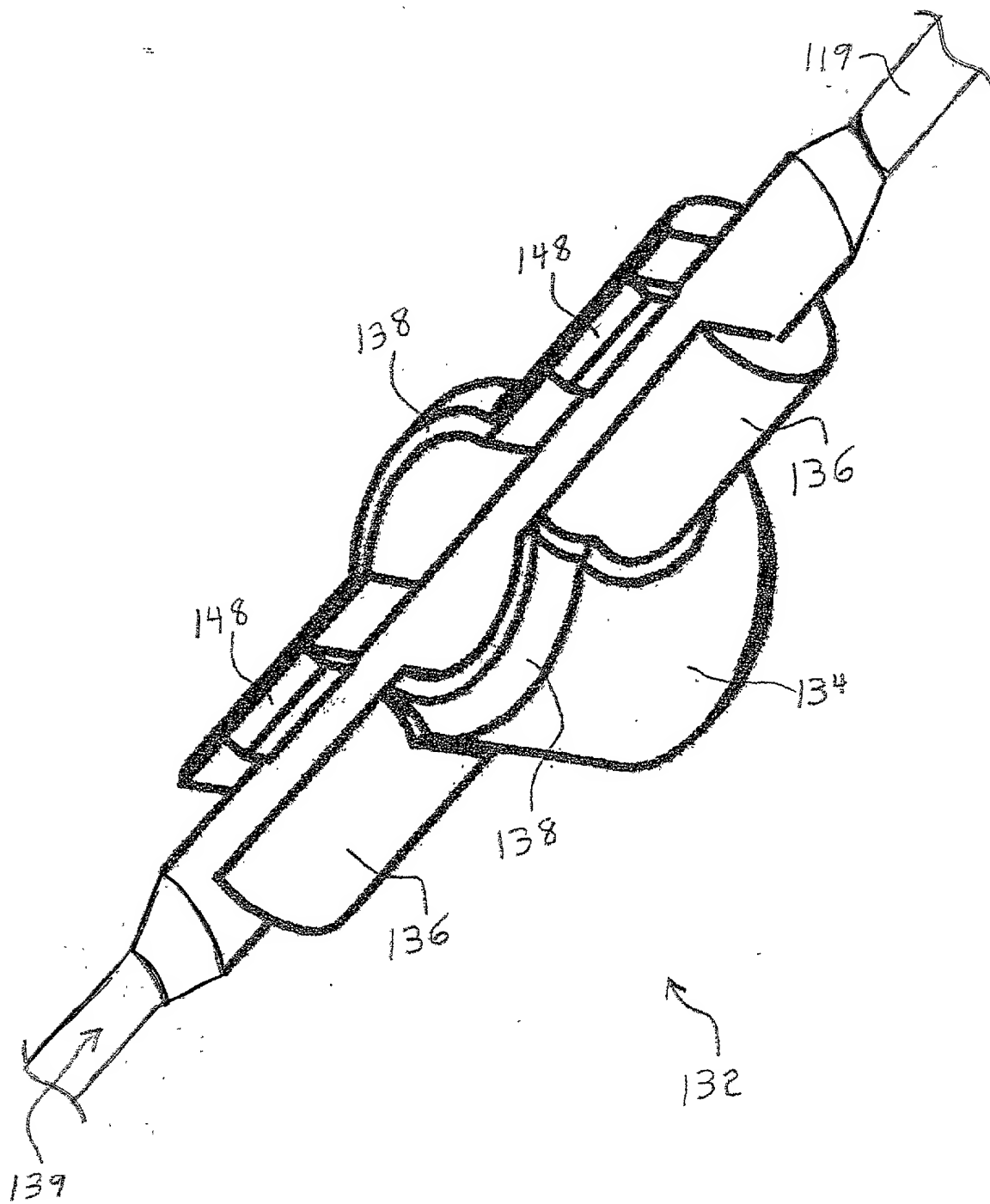


Fig. 9

66220-4E596A

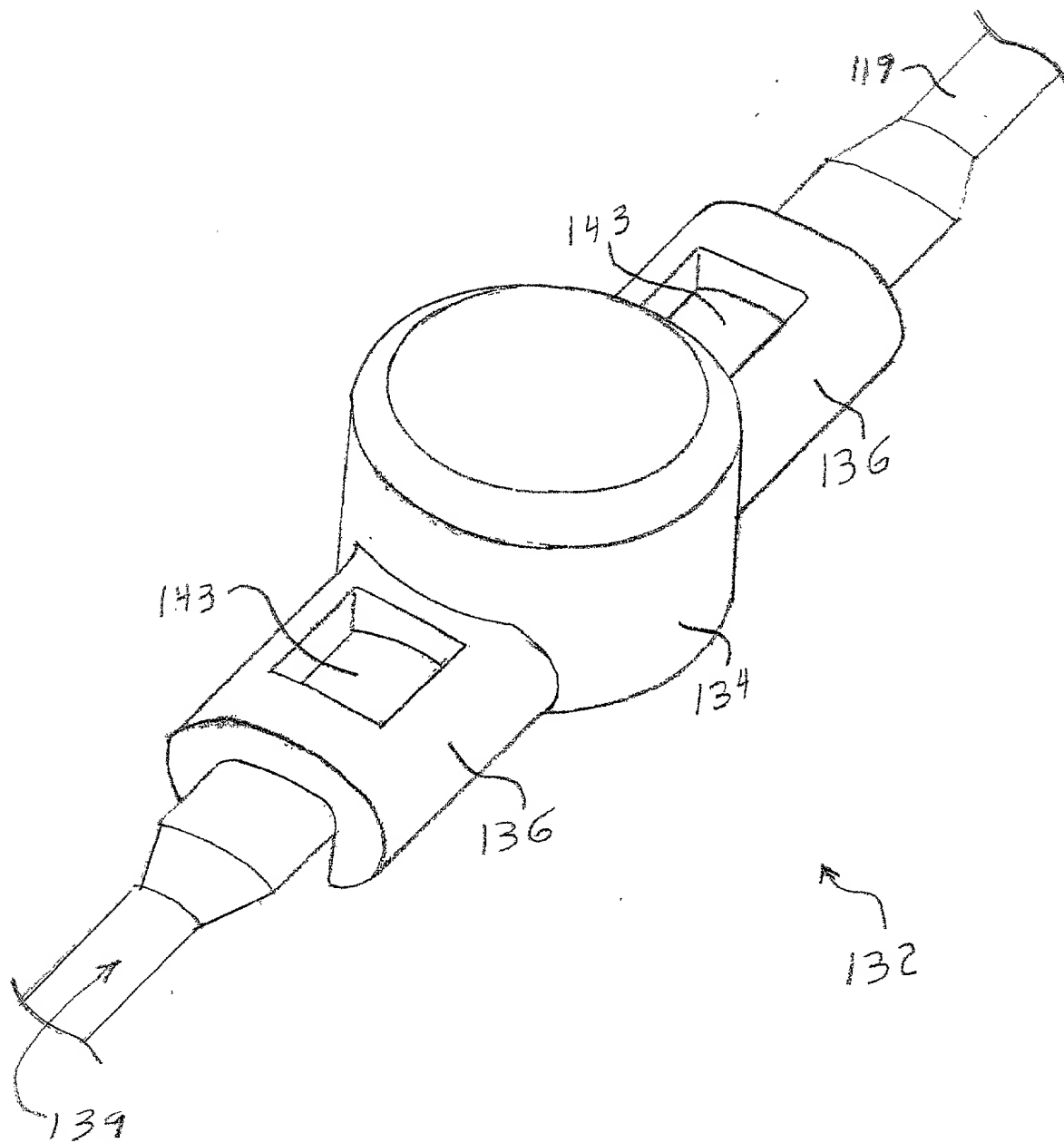


Fig. 10

[illegible]

Fig. 11

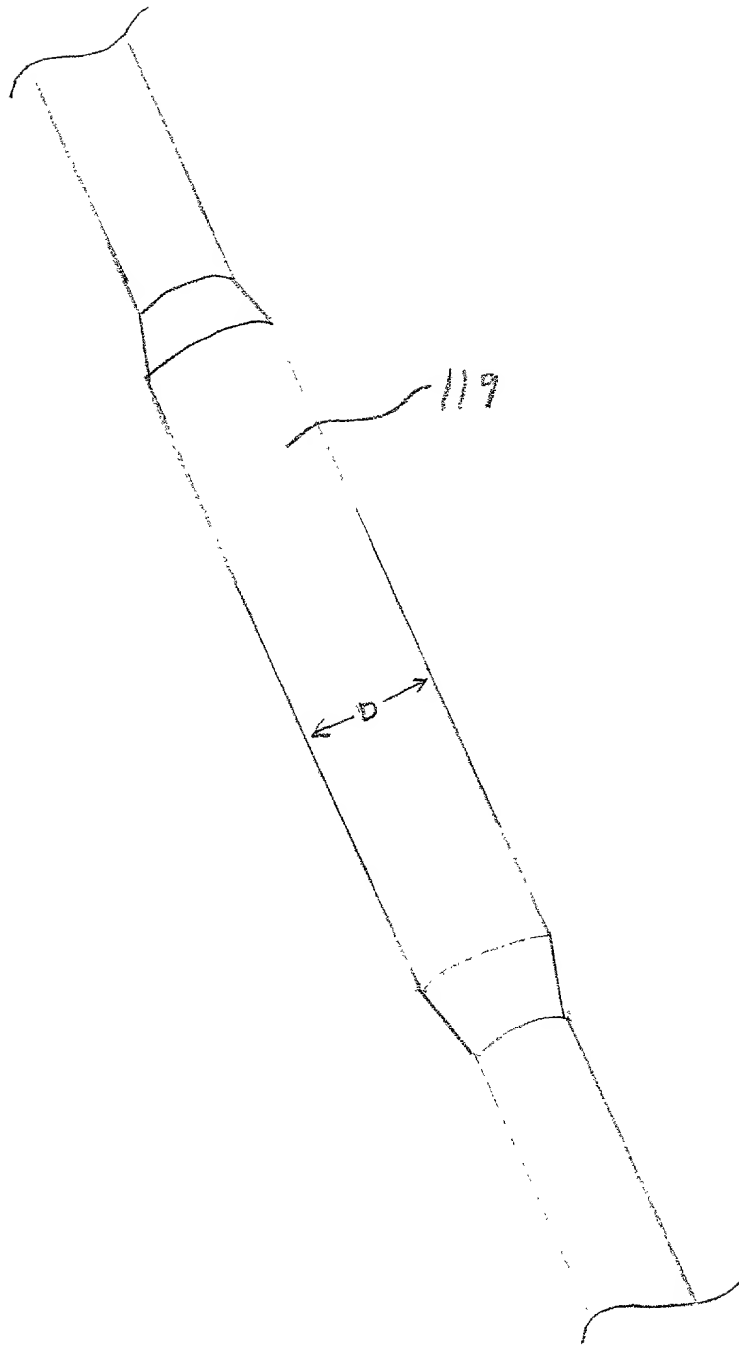


Fig. 12

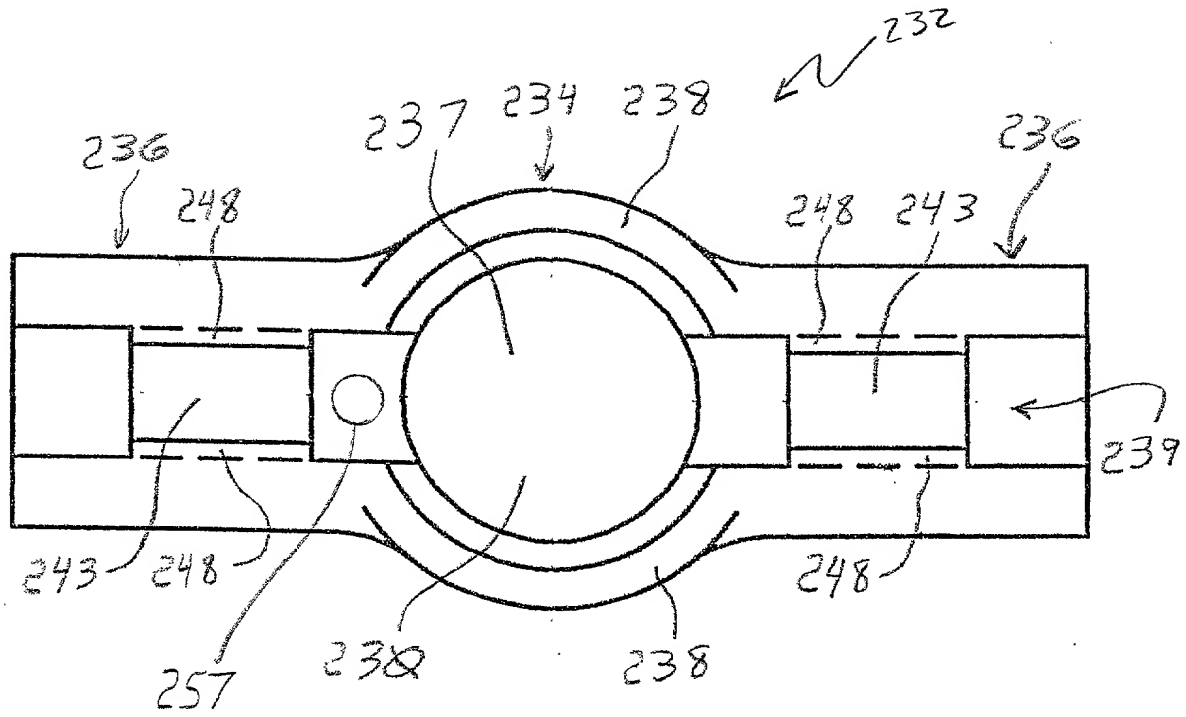


Fig. 13

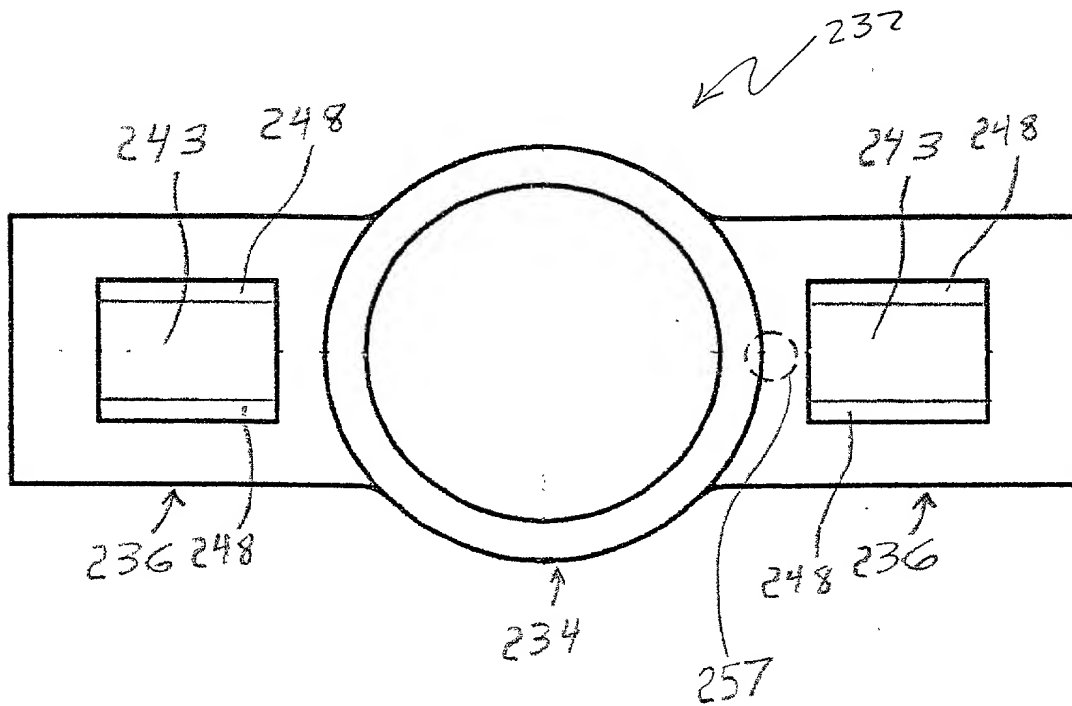


Fig. 14

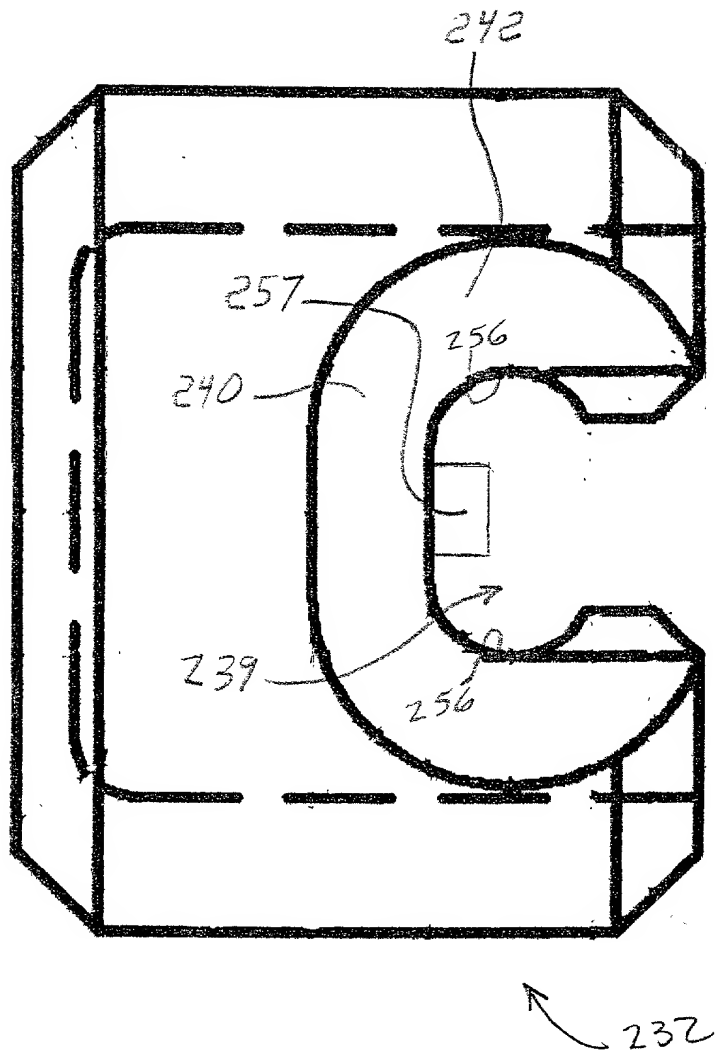


Fig. 15

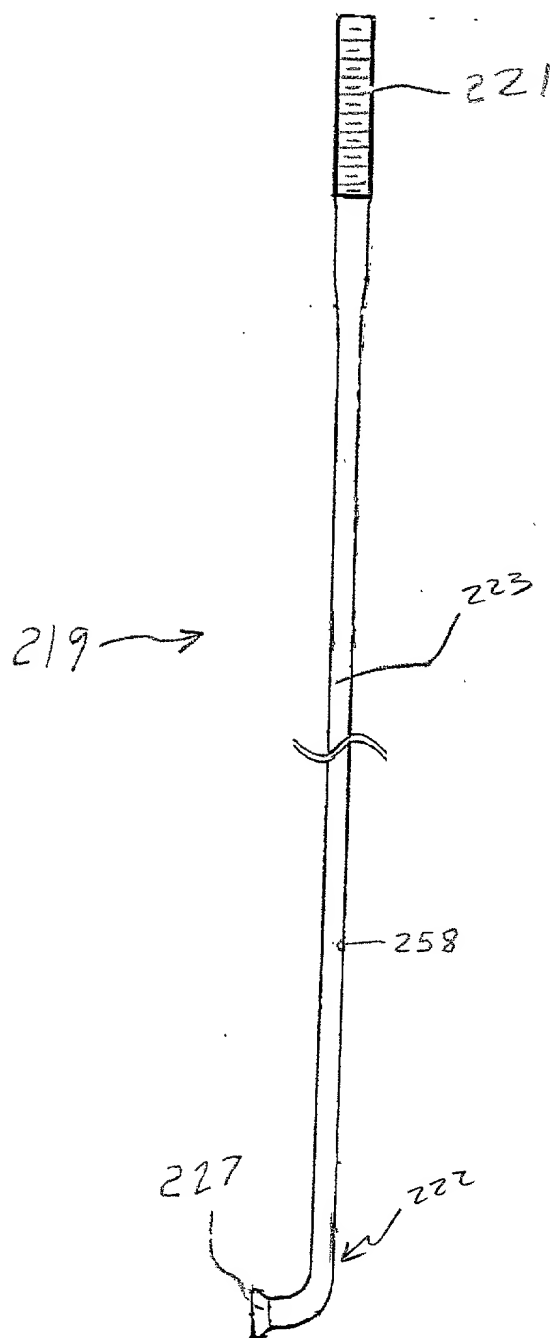


Fig. 16

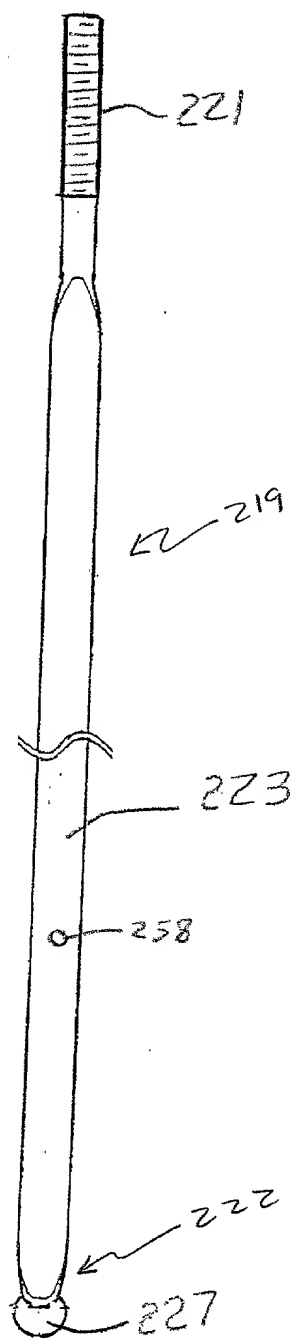


Fig. 17

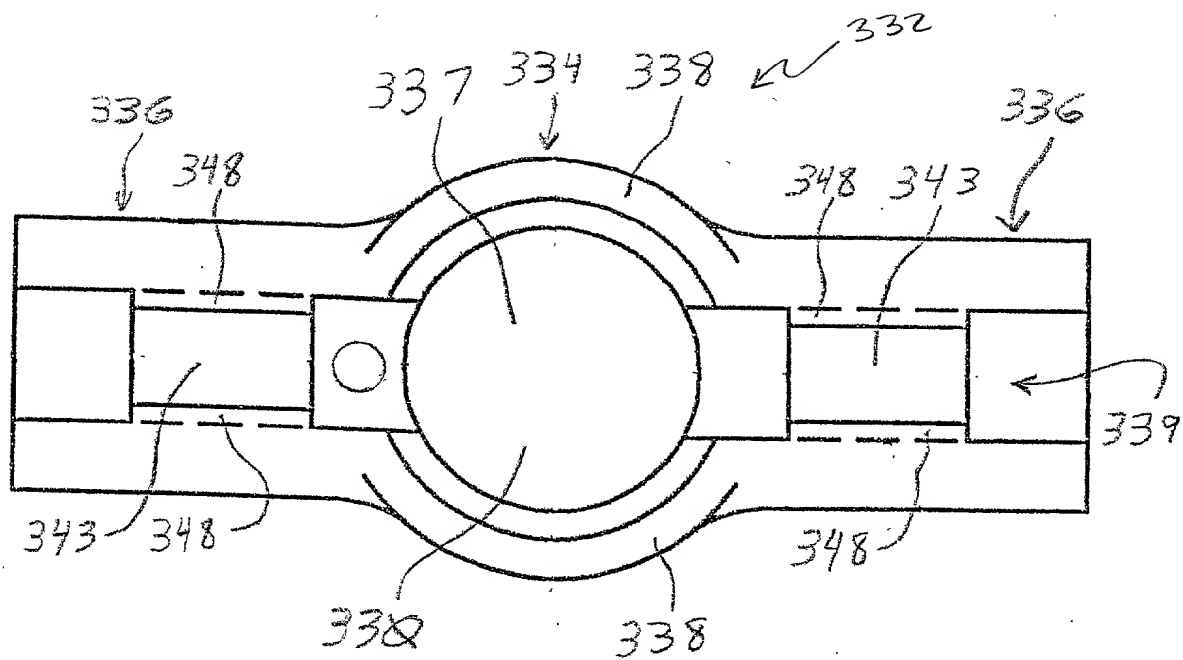


Fig. 18

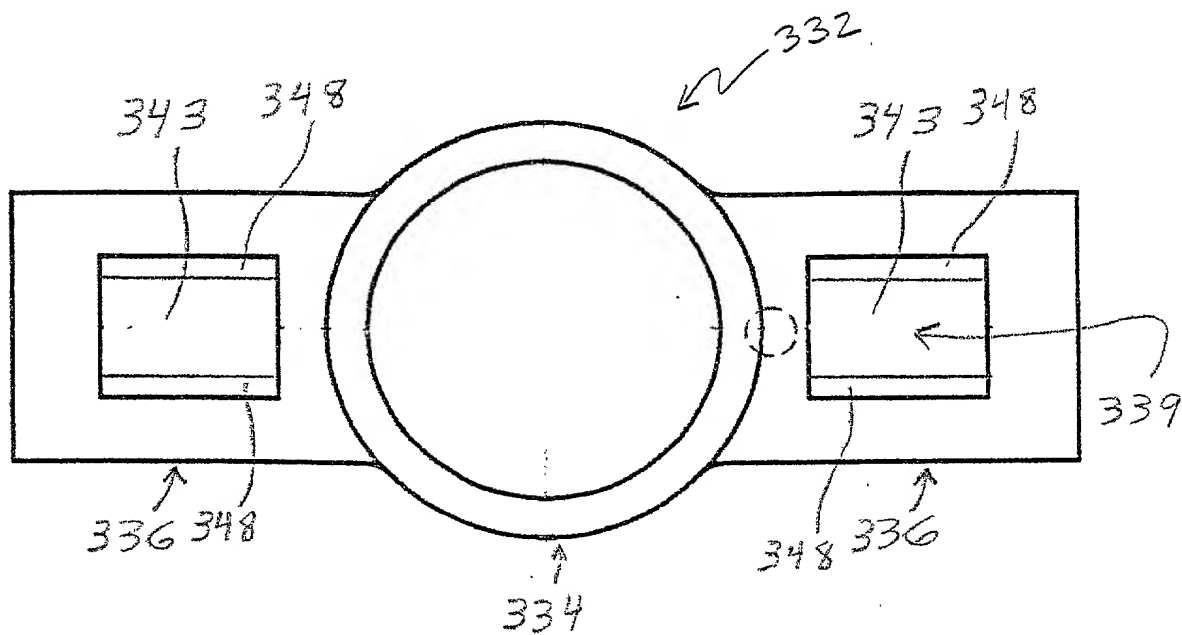


Fig. 19

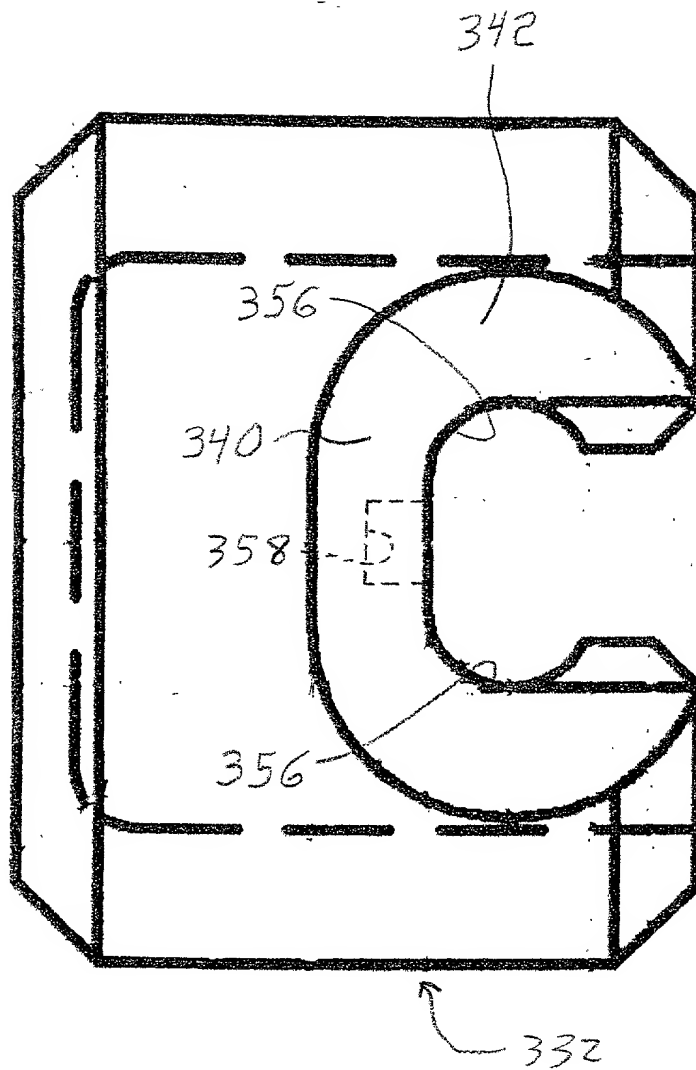


Fig. 20

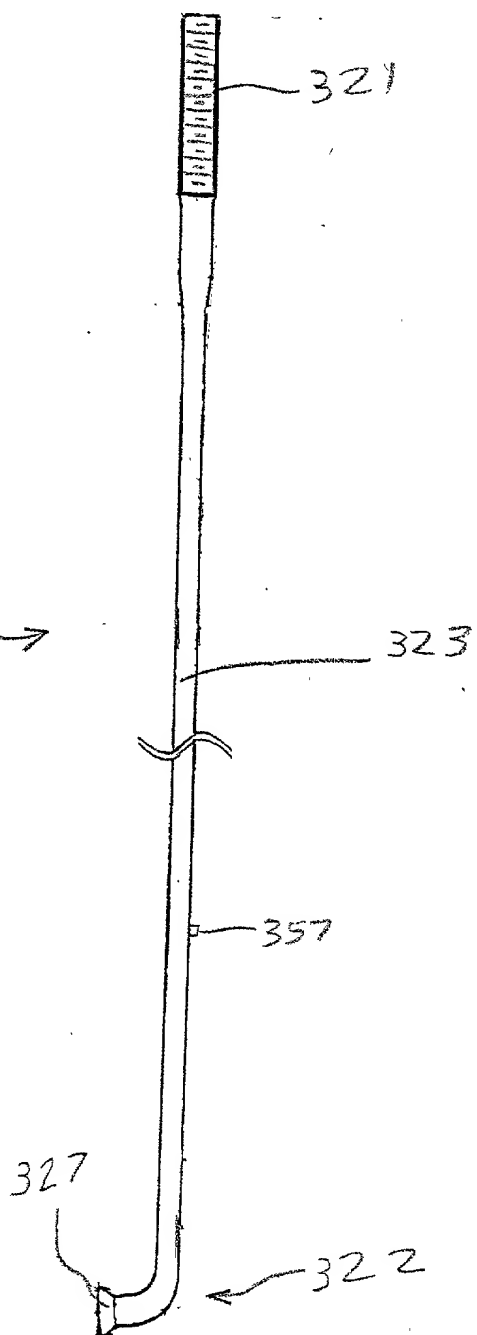


Fig. 21

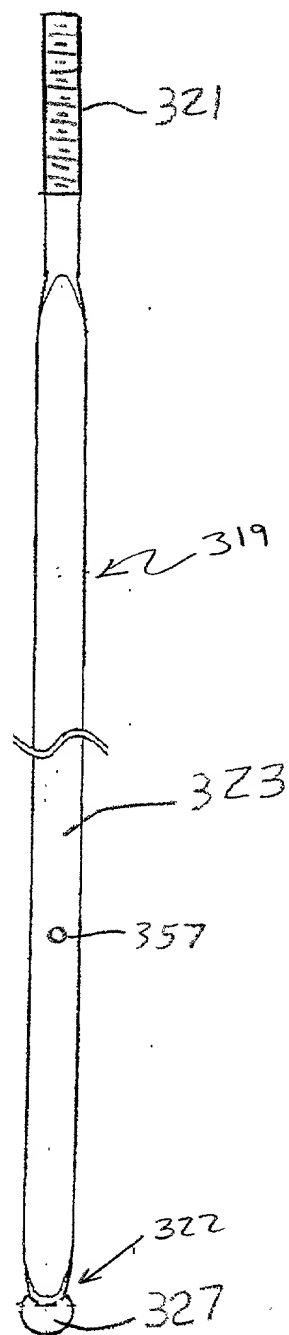


Fig. 22